

WHAT IS CLAIMED:

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1. A method of treating an object in a closed circuit solvent processing system, said system including a chamber, a first fluid supply tank in communication with said chamber and a second fluid supply tank in communication with said chamber, said method comprising the steps of:

placing an object to be processed in a chamber;

sealing said chamber;

reducing the pressure within said chamber to evacuate the air from said chamber to create a vacuum condition;

introducing a first fluid having a first concentration to said evacuated chamber from a first fluid supply tank to process said object contained in said chamber;

recovering and retaining said first fluid from said chamber to return said chamber to said evacuated vacuum condition;

introducing a second fluid having a second concentration to said evacuated chamber from a second clean fluid supply tank to process said object contained in said chamber;

recovering and retaining said second fluid from said chamber to return said chamber to said evacuated vacuum condition;

introducing a non-condensable gas to said chamber to return said chamber to atmospheric pressure;

opening said chamber and removing said object;

redistributing said first and second fluids to said first and second supply

tanks; and

returning said first and second fluids to said first and second concentrations and retaining said fluids for use in treating subsequent objects.

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2. The method of treating an object in claim 1 wherein said step of reducing the pressure within said chamber comprises reducing the pressure to between atmospheric pressure and zero absolute pressure.

3. The method of treating an object in claim 1 wherein said first and second fluids are selected from the group consisting of: organic solvents, water, and aqueous solutions.

4. The method of treating an object in claim 1 wherein the method used in the steps of introducing said first fluid and said second fluid into said chamber is selected from the group consisting of: liquid spray and liquid soak.

5. The method of treating an object in claim 1 wherein the fluid state of said first and second fluids during the steps of introducing said first fluid and said second fluid into said chamber is selected from the group consisting of: vapor, gas-vapor mixture and aerosol spray.

6. The method of treating an object in claim 1 wherein said first fluid in said first fluid supply tank and said second fluid in said second fluid supply tank each contain

a mixture of the same chemicals in differing concentrations.

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7. The method of treating an object in claim 1 wherein said first fluid in said first fluid supply tank and said second fluid in said second fluid supply tank can be mixed while processing said object.

8. The method of treating an object in claim 6, wherein said first fluid in said first fluid supply tank and said second fluid in said second fluid supply tank can be mixed while processing said object.

9. The method of treating an object in claim 1 wherein said step of redistributing said first and second fluids to said first and second supply tanks further comprises:  
heating said first fluid supply tank to evaporate a portion of said first fluid and distilling said evaporated portion of said fluid to said second fluid supply tank.

10. The method of treating an object in claim 1 wherein said step of redistributing said first and second fluids to said first and second supply tanks further comprises:  
transferring a portion of said first fluid from said first fluid supply tank to a heated distilling vessel;  
heating said removed portion of first fluid in said heated distilling vessel to evaporate said fluid; and  
distilling said evaporated portion of said fluid to said second fluid supply tank.

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11. The method of treating an object in claim 10, wherein said distilling vessel is selected from the group consisting of: single stage vessels, multiple stage vessels, tray distilling vessels, plate distilling vessels or fluidized distilling vessels.

12. The method of treating an object in claim 1 wherein said steps of recovering and retaining said first and second fluids from said chamber further comprise:

withdrawing a first portion of said fluid from said chamber in a liquid state;

and

withdrawing the remaining portion of said fluid from said chamber in a vapor state.

13. The method of treating an object in claim 12 wherein said step of withdrawing said fluid in a vapor state further comprises:

reducing the pressure in said chamber causing said fluid to flash to form a vapor; and

withdrawing said vapor from said chamber.

14. A method of treating an object in a closed circuit solvent processing system, said system including a chamber, a first fluid supply tank in communication with said chamber and a second fluid supply tank in communication with said chamber, said method comprising the steps of:

placing an object to be processed in said chamber;

sealing said chamber;  
reducing the pressure within said chamber to evacuate the air from said chamber to create a vacuum condition;  
introducing a first fluid to said evacuated chamber from said first fluid supply tank to process said object;  
removing said first fluid from said chamber to a first fluid holding tank to restore said vacuum condition;  
drying said object and said chamber;  
introducing a second fluid to said evacuated chamber from a second fluid supply tank to process the object;  
removing said second fluid from said the chamber to a second fluid holding tank;  
drying said object and said chamber;  
introducing a non-condensable gas to said chamber to return the pressure within said chamber to atmospheric pressure; and  
opening said chamber to remove said object.

15. The method of treating an object in claim 14 wherein said step of reducing the pressure within said chamber comprises reducing the pressure to between atmospheric pressure and zero absolute pressure.

16. The method of treating an object in claim 14 wherein said first and second fluids are selected from the group consisting of: organic solvents, water and

aqueous solutions.

17. The method of treating an object in claim 14 wherein the method used in the steps of introducing said first fluid and said second fluid into said chamber is selected from the group consisting of: liquid spray and liquid soak.

18. The method of treating an object in claim 14 wherein the fluid state of said first and second fluids during the steps of introducing said first fluid and said second fluid into said chamber is selected from the group consisting of: vapor, gas-vapor mixture and aerosol spray.

19. The method of treating an object in claim 14 wherein said first fluid in said first fluid supply tank and said second fluid in said second fluid supply tank each contain a mixture of the same chemicals in differing concentrations.

20. The method of treating an object in claim 14 wherein said first fluid in said first fluid supply tank and said second fluid in said second fluid supply tank each contain a mixture of different chemicals.

21. The method of treating an object in claim 14 wherein said steps of recovering and retaining said first and second fluids from said chamber further comprise:

withdrawing a first portion of said fluid from said chamber in a liquid state;

and

withdrawing the remaining portion of said fluid from said chamber in a vapor state.

22. The method of treating an object in claim 21 wherein said step of withdrawing said fluid in a vapor state further comprises:

reducing the pressure in said chamber causing said fluid to flash to form a vapor; and

withdrawing said vapor from said chamber.

23. The method of treating an object in claim 21 wherein said step of withdrawing said fluid in a vapor state further comprises:

circulating an unsaturated air-vapor mixture in a closed loop between said first and second fluid holding tanks and said chamber to dry said object and remove said vapor from said chamber.

24. The method of treating an object in claim 23 wherein said circulating air-vapor mixture is heated to increase the saturation point of the air-vapor mixture to improve said drying of said object.

25. The method of treating an object in claim 24 wherein said circulating air-vapor mixture is compressed and cooled to decrease the solvent vapor content of the air-vapor mixture to improve said drying of said object.